

AMENDMENTS TO THE CLAIMS

The claims are as follows:

1. (Currently amended): A method of interconnecting a network infrastructure via a plurality of communication links comprising:
defining a link affinity grouping based on a plurality of criteria including throughput for round-robin scheduling and throughput for a next available link scheduling;
classifying the plurality of communication links according to a link affinity grouping;
enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping; and
activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping.
2. (Original): The method according to Claim 1 further comprising:
analyzing performance of the enabled communication links individually and in aggregate.
3. (Original): The method according to Claim 2 further comprising:
determining whether the aggregate performance has declined to below a predetermined limit.
4. (Original): The method according to Claim 3 further comprising:
generating an alert signal when the aggregate performance declines to below the predetermined limit.
5. (Original): The method according to Claim 2 further comprising:
identifying an individual link wherein, based on the analysis, disabling of the identified link from the aggregate in the link affinity grouping will improve aggregate throughput.

6. (Original): The method according to Claim 5 further comprising:
automatically disabling the identified link.
7. (Original): The method according to Claim 5 further comprising:
recommending disabling of the identified link.
8. (Original): The method according to Claim 2 further comprising:
recommending, based on the analysis, appropriate individual links for
inclusion into a link affinity grouping based on criteria selected from
among a group consisting of:
potential throughput, link path security ratings, logical unit (LUN)
group criticality ratings, potential throughput according to the
link selection process, link cost, link availability, primary and
secondary replication classification, inclusion or exclusion of
multiple link affinity groups, inclusion of partial or full link
affinity groups, and link direction.
9. (Original): The method according to Claim 2 further comprising:
determining, based on the analysis, whether altering assignment of links of
two link affinity groups will improve throughput of both groups.
10. (Original): The method according to Claim 2 further comprising:
selecting a link for activation in a data replication operation comprising:
maintaining a list of available links;
including a link on the list when the link becomes available;
activating the next available link on the list;
sending information over the activated next available link;
receiving the sent information at a remote site; and
reordering the received information into a proper order at the remote
site.

11. (Currently amended): A method of communicating data in a network infrastructure via a plurality of communication links comprising:

interconnecting a plurality of communication links between a local array and a remote array;

determining which of the plurality of communication links is currently available for usage;

maintaining a list of links available to carry the data;
including a link on the list when the link becomes available;
activating the next available link on the list; and
sending data over the activated next available link.

12. (Original): The method according to Claim 11 further comprising:
receiving the sent data at the remote array; and
reordering the received data into a proper order at the remote array.

13. (Original): The method according to Claim 12 further comprising:
destaging the reordered data to disk in a data replication application.

14. (Currently amended): A storage system comprising:
an interface capable of interconnecting a network infrastructure via a plurality of communication links, the plurality of communication links having a diversity of data-carrying capacity and performance; and
a controller coupled to the interface that assigns the plurality of communication links into at least one link affinity group based on performance criteria including throughput for round-robin scheduling and throughput for a next available link scheduling, and that controls link selection based on link affinity group assignment.

15. (Original): The storage system according to Claim 14 wherein:
the controller analyzes performance of the enabled communication links individually and in aggregate.

16. (Original): The storage system according to Claim 15 wherein: the controller manages synchronous and unordered asynchronous disk array replication by communicating data over all available links in a round-robin order, determines whether the aggregate performance has declined to below a predetermined limit, and generates an alert message for performance declines below the limit.

17. (Original): The storage system according to Claim 16 wherein: the controller identifies individual links wherein, based on the analysis, disabling of the identified link from the aggregate in the link affinity grouping will improve aggregate throughput.

18. (Original): The storage system according to Claim 15 wherein: the controller manages ordered asynchronous disk array replication by enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping, and activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping.

19. (Original): The storage system according to Claim 18 wherein: the controller selects a link for activation in a data replication operation by: maintaining a list of available links; including a link on the list when the link becomes available; activating the next available link on the list; sending information over the activated next available link; receiving the sent information at a remote site; and reordering the received information into a proper order at the remote site.

20. (Original): The storage system according to Claim 18 wherein: the controller determines whether the aggregate performance has declined to below a predetermined limit, and generates an alert message for performance declines below the limit.

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21. (Original): The storage system according to Claim 18 wherein: the controller determines appropriate individual links for inclusion into a link affinity grouping based on criteria selected from among a group consisting of: potential throughput, link path security ratings, logical unit (LUN) group criticality ratings, potential throughput according to the link selection process, link cost, link availability, primary and secondary replication classification, inclusion or exclusion of multiple link affinity groups, inclusion of partial or full link affinity groups, and link direction.

22. (Original): The storage system according to Claim 18 wherein: the controller identifies individual links wherein, based on the analysis, disabling of the identified link from the aggregate in the link affinity grouping will improve aggregate throughput.

23. (Original): The storage system according to Claim 18 wherein: the controller determines, based on the analysis, whether altering assignment of links of two link affinity groups will improve throughput of both groups.

24. (Original): The storage system according to Claim 15 wherein: the controller manages disk array replication using a protocol converter by communicating data over all available links in a round-robin order over identical throughput links.

25. (Currently amended): An article of manufacture comprising: a tangible controller usable medium having a ~~computable~~ computer readable program code embodied therein for interconnecting a network infrastructure via a plurality of communication links, the ~~computable~~ computer readable program code further comprising: a code causing the controller to define a link affinity grouping based on a plurality of criteria including throughput for round-robin scheduling and throughput for a next available link scheduling;

a code ~~capable of~~ causing the controller to classify the plurality of communication links according to a link affinity grouping;
a code ~~capable of~~ causing the controller to enable and disable selective ones of the plurality of communication links according to the link affinity grouping;
a code ~~capable of~~ causing the controller to activate a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping; and
a code ~~capable of~~ causing the controller to analyze performance of the enabled communication links individually and in aggregate.

26. (Currently amended): The article of manufacture according to Claim 25 further comprising:

a code ~~capable of~~ causing the controller to determine, based on the analysis, appropriate individual links for inclusion into a link affinity grouping based on criteria selected from among a group consisting of: potential throughput, link path security ratings, logical unit (LUN) group criticality ratings, potential throughput according to the link selection process, link cost, link availability, primary and secondary replication classification, inclusion or exclusion of multiple link affinity groups, inclusion of partial or full link affinity groups, and link direction.

27. (Currently amended): The article of manufacture according to Claim 25 further comprising:

a code ~~capable of~~ causing the controller to maintain a list of available links;
a code ~~capable of~~ causing the controller to include a link on the list when the link becomes available;
a code ~~capable of~~ causing the controller to activate the next available link on the list;
a code ~~capable of~~ causing the controller to send information over the activated next available link;

a code ~~capable of~~ causing the controller to receive the sent information at a remote site; and
a code ~~capable of~~ causing the controller to reorder the received information into a proper order at the remote site.

28. (Currently amended): An article of manufacture comprising:

a tangible controller usable medium having a ~~computable~~ computer

readable program code embodied therein for communicating data among a network infrastructure via a plurality of communication links, the ~~computable~~ computer readable program code further comprising:

a code ~~capable of~~ causing the controller to interconnect a plurality of communication links between a local array and a remote array;

a code ~~capable of~~ causing the controller to determine which of the plurality of communication links is currently available for usage;

a code ~~capable of~~ causing the controller to maintain a list of links available to carry the data;

a code ~~capable of~~ causing the controller to include a link on the list when the link becomes available;

a code ~~capable of~~ causing the controller to activate the next available link on the list; and

a code ~~capable of~~ causing the controller to send data over the activated next available link.

29. (Currently amended): The article of manufacture according to Claim 28 further comprising:

a code ~~capable of~~ causing the controller to receive the sent data at the remote array;

a code ~~capable of~~ causing the controller to reorder the received data into a proper order at the remote array; and

a code ~~capable of~~ causing the controller to destage the reordered data to disk in a data replication application.

30. (Currently amended): A storage system comprising:
means for interconnecting a network infrastructure via a plurality of
communication links;
means for determining which of the plurality of communication links is
currently available for usage;
means for classifying the plurality of communication links according to a
link affinity grouping;
means for enabling and disabling selective ones of the plurality of
communication links according to the link affinity grouping;
means for activating a particular link selected from among the enabled
communication links using a selection process adapted to
characteristics of the link affinity grouping;
means for analyzing performance of the enabled communication links
individually and in aggregate; and
means for determining whether the aggregate performance has declined to
below a predetermined limit.

31. (New): The method according to Claim 1 further comprising:
defining the link affinity grouping based on a plurality of criteria further
including characteristics of link path security, link cost, and
conditions of link availability.

32. (New): The method according to Claim 31 further comprising:
defining the link affinity grouping (LAG) based on a plurality of criteria
further including classification as primary and secondary link groups
for replication of a logical unit (LUN) group, classification into intra-
LAG groups, classification into inter-LAG partial inclusion groups,
classification into inter-LAG full inclusion groups, classification as
outbound (failover) links, and classification as inbound (failback)
links.

33. (New): The storage system according to Claim 14 further comprising:
the controller that assigns the communication link plurality into at least one
link affinity group based on performance criteria further including

characteristics of link path security, link cost, and conditions of link availability.

34. (New): The storage system according to Claim 14 further comprising: the controller that assigns the communication link plurality into at least one link affinity group based on performance criteria further including classification as primary and secondary link groups for replication of a logical unit (LUN) group, classification into intra-LAG groups, classification into inter-LAG partial inclusion groups, classification into inter-LAG full inclusion groups, classification as outbound (failover) links, and classification as inbound (failback) links.